

MODIS

Emergency Back-up System

System Integration and Test Plan



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MODIS Emergency Back-up System Integration and Test Plan

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MODIS Emergency Back-up System Integration and Test Plan

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MODIS Emergency Back-up System Integration and Test Plan

1. INTRODUCTION

This test plan describes the system Integration and Test (I&T) approach for the Moderate Resolution Imaging Spectroradiometer (MODIS) Emergency Back-up System (MEBS). This approach includes planning details on how various system integration tests will be executed to verify compliance with the system requirements allocated to MEBS.

The MEBS integration and test plan is developed in accordance with the guidelines contained in the MEBS Software Development Plan (SDP) (Reference Document h.) and the MODIS/MEBS Science Data Support Team (SDST) Process Manual (Reference Document i.). These two guiding documents incorporate the Common Approach to System Development and Maintenance Procedures used within the SAIC/GSC system development environments.

1.1 Purpose and Scope

This plan covers the verification of MEBS system requirements, MEBS internal interfaces (hardware and/or software subsystems), external interfaces with the Goddard Space Flight Center (GSFC) Distributed Active Archive Center (DAAC) of the Earth Observing System (EOS) Data Information System (EOSDIS) and other elements (Level 0 and/or Ancillary data providers) assigned to support MODIS data processing. The focus of this plan is more on the functional and performance testing of MEBS capabilities and less on the verification of the contents of the products/granules generated by MODIS Product Generation Executives (PGEs).

1.2 MEBS Overview

The MEBS is being developed by the MODIS SDST to assure the availability of a contingency system, in case the EOSDIS Core System is not ready in time to support the AM-1 launch in June 1998. The primary objective of the MEBS is to meet validation, quality assurance, and early science needs of the MODIS Science Team (MST). The MEBS is being developed under an expedited schedule to support pre-launch development, test, and optimization of the MODIS algorithms in versions that are identical to those used in the EOSDIS system. It will provide sufficient processing and data distribution capabilities to meet the immediate post-launch test and validation requirements of the MODIS Science Team. It will also provide limited data distribution to other AM-1 instrument teams and the DAACs. The MEBS will meet all instrument team and DAAC functional requirements for EOSDIS Release B.0 specified in the "Prioritized Requirements for Release B" document with the exception of spacecraft command and control, receiving down-link science and telemetry data from the

spacecraft, and producing Level 0 packets. MEBS system development will reuse major components of the SeaWiFs production system which is compatible with MODIS processing concepts and implements the features required for MODIS instrument data processing.

1.3 References

- a. An Emergency backup System to Support MODIS Algorithm Validation for Six Months Following AM-1 Launch, July 1997.
- b. MODIS Emergency Back-up System Requirements Specification, SDST-097, July 25, 1997.
- c. MODIS Emergency Backup System Architectural Document, Review Draft, SDST-098, June 2, 1997.
- d. MODIS Emergency Backup System High-Level Architectural Review (including supporting documentation), August 12, 1997.
- e. MODIS Version 1 Team Leader Computing Facility Integration and Test Plan, SDST-068, July 8, 1996.
- f. MODIS Emergency Back-up System Data Management Archive - File Storage and Retrieval Proof of Concept Test Procedure, August 14, 1997.
- g. MODIS Emergency Back-up System Version "Hour-in-the-Life" Test Definition - September 3, 1997.
- h. MEBS Software Development Plan, SAIC/GSC (based on Common Approach to System Development and Maintenance Procedures used at SAIC/GSC), SDST-TBD, September 1997.
- i. MODIS Science Data Support Team Process Manual, SDST-105, December 1997.
- j. MODIS Science Data Processing Software Version 1 System Description, SDST-065, April 18, 1997.
- k. MODIS Science Data Processing Software Version 2 System Description, SDST-104.

1.4 MEBS Integration and Test Strategy

In order to assure the delivery of an emergency back-up capability for the GSFC DAAC, approximately three months before the AM-1 launch, the MEBS implementation includes a significant reuse of the existing SeaWiFs data processing system components for providing MODIS product generation and data distribution capabilities. This development approach has required the MODIS SDST MEBS Task to configure and conduct a number of prototype tests early on to assess the suitability of SeaWiFs and Commercial-Off-the-Shelf (COTS) components for implementing

MEBS functions. The MEBS Task has benefited from these early prototypes by learning about SeaWiFs processing capabilities and identifying a minimum set of COTS items (hardware and software) and custom software for implementing the MEBS. In addition, due to a short implementation schedule and to minimize risks, the MEBS Task has chosen an evolutionary system development approach. Using this approach, the MEBS Task is able to develop, build, and test MEBS incrementally and learn about implementation problems within short time periods. The overall MEBS development and integration and test scheme is based on verifying the gradual integration of SeaWiFs reusable components (such as the scheduler), COTS software for handling nearline tape libraries, external interfaces, and custom software, as required, at the completion of each MEBS build. Table 1-1 provides an overview of the MEBS system/software build plan based on the evolutionary development methodology. This plan indicates when a component and or integrated components (builds) of MEBS software will be available for system testing and for verifying the requirements allocated to MEBS.

The MEBS implementation has also benefited from the reuse of the MODIS data processing algorithms or PGEs currently being developed for the EOSDIS Project. The availability of a number of these PGEs has allowed the MEBS task a “no-wait” opportunity for integrating them into MEBS software environment which is adapted and/or tailored from the SeaWiFs processing system. Again, the continual integration and evaluation of MODIS PGEs in the MEBS environment yields early implementation results and provide opportunity for risk mitigation. The list of MODIS PGEs which will be integrated in the MEBS environment during a series of system builds can be found on the World Wide Web (WWW) at Universal Resource Locator (URL): <http://ltpwww.gsfc.nasa.gov/MODIS/SDST/mebs>. These PGEs will be integrated into MEBS in two phases:

1. Phase 1 integration of MODIS Version 1 (V1) software
2. Phase 2 integration of MODIS Version 2 (V2) software.

In addition, the PGEs will also be tested, along with all functional capabilities of MEBS, during system and system integration tests (Section 4).

The MEBS I&T approach consists of integrating and testing a combination of prototypes and integrated builds provided by MEBS software development over a short period of time. These prototypes and integrated system builds (turnovers) are evaluated by the system test group through formal and/or informal demonstrations, system testing of MEBS key functions, and integration and testing of system interfaces during end-to-end testing.

The various symbols used in Table 1-1 are defined as follows:

- X: MEBS full function is expected to be available and tested in this build.
- X?: No/Partial MEBS function may be available and tested in this build.
- O: Available MEBS function may not be tested in this build.
- X-suffix: The “suffix” identifies the extent of the MEBS function tested in a build. For example, X-ARQ indicates testing of the ARQ capability of the Archive function.
- Ver-#: Indicates the MODIS Science Software (PGEs) version (by number) needed in testing the MEBS.

The MEBS Functions used in Table 1-1 are defined as follows:

- DITS Data Ingest and Track Subsystem
- DORS Data Ordering Subsystem
- DPDS Data Processing Disposition Subsystem
- EIFS External Interface Requirements
- LSCS Local Storage and Catalog Subsystem
- MEBS MEBS overall Subsystem
- MMPS Make MODIS Products Subsystem
- MNPS Monitor Production Subsystem
- RPMS Report Production Metrics Subsystem
- SQRs System Qualification Requirements Subsystem

Table 1-1. Build Requirements, Functions, and Software Allocations

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2. TEST ACTIVITIES

This section presents an overview of MEBS integration and system test activities performed by the MEBS software development and/or the system test group throughout the project life-cycle.

2.1 Test Preparation

The test preparation phase consists of test plan development, test tool preparation, test data generation, training of test personnel, and test environment preparation. At the end of the test planning phase, and prior to testing of a prototype and/or a build, preparation includes test procedures development, test procedure walkthrough, and the Test Readiness Review (TRR).

Because the MEBS system test team will work closely with the software development team, the need for any MEBS special training is not anticipated at this time. The test team may require some Just-In-Time (JIT) training on test management tools such as the Distributed Defect Tracking system (DDTs) and ClearCase.

Informal demonstration and/or user's guides should be available to test personnel for:

- SeaWiFs/MEBS COTS items
 - Quick Restore
 - IRIX Networker
- Test Tools:
 - MEBS Scripts (include SeaWiFs Scripts)
 - Hierarchical Data Format (HDF) Toolkit
 - Interactive Data Language (IDL)
- Test Data Generators/Sources
 - Level 1B (L1B) synthetic data set generator (software tool - Source: GSC)
 - Level 1A (L1A) from L1B synthetic data set (software tool - Source: GSC)
 - Level 0 from L1A data set (software tool - Source: GSC)
- MEBS Operator and User Interfaces
- MEBS Database Management and Administration

- Test Management Support Tools
 - DDTs
 - ClearCase

2.2 Test Conduct

When test preparation is complete and the current build software has been turned over, the test group begins Test Conduct activities. The primary activities include test execution and analysis of the delivered system/software functions and the output files. In addition, test status and progress are continually reported and the DDTs (problem) reports are also generated, as necessary. For a build that requires release/delivery to the customer, the delivery package is finalized during the Test Conduct phase.

2.3 Test Management

Test management of the MEBS includes preparation of daily productivity status reports, weekly status reports and metrics, and formal presentation of system TRRs. During system requirements verification/test activity phase, a summary of test execution, problem (DDTs) reports, and major milestones is provided in the weekly status reports, along with overall progress of the testing. These reports will be distributed to all SDST and MEBS Task personnel via the e-mail system. Details on MEBS test status and problems will also be reviewed with the customer in the weekly MEBS status meetings. Special meetings may be called to review test problems requiring immediate attention of either the MEBS task leads and/or the customer.

2.4 Internal Configuration Control

Maintaining configuration control of MEBS software, tools, data, and environments is necessary to minimize the efforts and risks inherent in developing and testing incrementally changeable software. The MEBS software development and system integration and test groups are jointly responsible for the MEBS Configuration Management (CM). The MEBS Task will utilize the ClearCase tool for managing the configuration of all COTS/ Government Furnished Equipment (GFE) software, MEBS custom software, test data and tools, and environment related system software and libraries.

The MEBS Task, through its CM representative, will manage and maintain both informal and formal CM controls over MEBS software, hardware, test data, tools, and environment. The MEBS software development group will use the MEBS "Development" informal/internal CM level for managing and maintaining all developed software. The "TEST" CM level, still informal, will introduce the first level of control to the software turned over by the development group. After successful verification testing of MEBS "Day-in-the-Life," "Week-in-the-Life," and "End-to-End" software turnovers/builds, they will be formally promoted to the "Production" CM level

(environment) for simulation of MEBS operations. Other builds will only be promoted to the "Production" CM level upon MEBS Project request. In addition, MEBS CM will also maintain a formal "COTS" library for managing and controlling the various versions of COTS and GFE software received and used in MEBS build testing. The MEBS Task will use the Configuration Change Request (CCR) process and Configuration Change Board (CCB) reviews for accepting and maintaining all changes to formal MEBS configurations.

2.5 Test Data

Development, subsystem integration and system test personnel require data to test individual units, modules, hardware and software subsystems, and the MEBS system as a whole. The MODIS LEVEL 0 simulator will be used throughout MEBS development life cycle to generate MODIS Level 0 data required in the format specified in the MODIS-MEBS Interface Control Document (ICD). The Level 0 test data will later be used to generate Level 1 (L1) and Level 2 (L2) test data, as required by MEBS test procedures. All test data will be validated and put under CM control before it's use in system testing of a software turnover/build.

2.6 Test Tools

Development and system test groups will be responsible for identifying, specifying, and developing and/or acquiring the test tools required to analyze the data and results collected from MEBS testing. MEBS will validate and move all test tools to the "COTS" formal CM library before their use in system testing.

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3. SOFTWARE (CSCI) INTEGRATION TESTING

Software Computer Software Configuration Item (CSCI) integration testing is required to verify software subsystem interfaces including the data passed via the interfaces. The MEBS software development group will perform MEBS software integration to verify the flow of data between subsystems, exercise error handling paths, verify path coverage in general, and test functional performance.

Software CSCI integration tests are informal tests which are conducted by the MEBS Software Development Group with active support from the System Integration and Test Group. The MEBS software development group, as a result, will be responsible for defining the scope, conducting, and internally tracking these tests. These tests are expected to verify the integration of the following subsystems, per allocated software requirements before their turnover to the system integration and test group:

- 1.0 Data Ingest and Track (Requirement Name: Data Ingest and Track)
 - 1.1 Level 0 Ingest
 - 1.2 Ancillary Ingest
 - 1.3 Ephemeris Ingest
 - 1.4 Metadata Extractor
- 2.0 Product Generator (Requirement Name: Make MODIS Products)
 - 2.1 Scheduler (Requirement Name: Data Processing Disposition)
 - 2.2 Stager
 - 2.3 Production
 - 2.4 Operational Monitoring
- 3.0 Monitor Production (Requirement Name: Monitor Production)
 - Job Catalog (Requirement Name: Production Metrics)
- 4.0 MEBS Data Ordering (MEBDOS) (Requirement Name: Data Ordering System)
 - 4.1 User Registration
 - 4.2 Product Searcher
 - 4.3 Product Selector
 - 4.4 Standing Order Searcher
 - 4.5 Data Distribution
 - Browse Image Generation
- 5.0 Archiver (Requirement Name: Local Storage and Catalog)
 - 5.1 Archive Controller
 - 5.2 Archive Transfer
 - 5.3 Hardware Abstraction Layer
 - 5.4 Disk Space Monitor

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4. SYSTEM TESTING

4.1 Objectives

The primary objective of system testing is to verify the functional, performance, and operational requirements allocated to the MEBS. The MODIS Emergency Back-up System Requirements Specification is the basis for the system test design defined in this test plan.

In addition to functional requirements verification, MEBS system testing also includes executing operational scenarios (system integration tests): “Hour-in-the-Life Test” (HILT), “Day-in-the-Life Test” (DILT), and “Week-in-the-Life Test” (WILT) to simulate as much of an operational system as possible. An “End-To-End Test” (ETET) is also performed which encompasses MEBS software functions and interfaces with external elements [such as EOS Data and Operations Systems (EDOS) and ancillary data providers] supporting the MEBS.

4.2 Test Case Definition

The MODIS Emergency Back-up System Requirements Specification and the MEBS Preliminary Design Review (PDR) package are the basis for defining system test sets and test cases in this test plan. System test cases are mapped to allocated MEBS requirements. These test cases exercise MEBS processes in a manner that verifies the allocated requirements are satisfied. For requirements that are satisfied by operational procedures rather than MEBS software, test cases follow the operational scenarios defined in the PDR presentation and/or defined in this test plan and associated procedures.

Functional tests focus on valid, invalid, or incompletely keyed data inputs to the system. Performance tests focus on data volume handling capabilities, response times, and data throughputs. Operational scenario tests exercise system functions in combinations that are most likely to occur during daily operations. To save time and avoid duplication of test efforts, performance test cases may be included with functional and/or operational scenario tests.

System test cases are grouped into test sets by MEBS function. Tests within a test set are generally independent of each other, but may follow a data flow that defines the most suitable and/or required order of test execution, thus simulating a MEBS functional or operational scenario. It is important that test sets must be executed in a specific order (e.g., data ingest must precede data processing), unless simulations are used to satisfy the prerequisites for test executions. Details on test dependencies are provided with test descriptions.

4.3 Test Procedures

System test procedures consist of step-by-step instructions for executing individual test cases. Depending on the extent of test step details required for the test cases, test procedures could also be integrated to cover a whole test set (set of test cases). Test procedures are written based on details of MEBS operations documented in the MEBS user's/operator's guide and/or the information learned through discussions with developers and/or prototype demonstrations. An initial set of procedures is developed for each build, presented at a test procedure walkthrough, and updated as required before the build testing begins. During test execution, test procedures are red-lined to adjust for software changes and omissions in test steps. At the end of the system build test, the procedures are updated and form the basis of the next build's test procedures. At the end of last system build testing, the I&T test procedures updated from noted red-lines form the comprehensive test procedure package for the MEBS.

The MEBS test procedures will be developed in accordance with the guidelines provides in the MODIS SDST Process Manual, Integration and Test Section (Reference document i).

4.4 Test Procedures Walkthroughs

A system Test Procedure Walkthrough will be held for each build as part of the test preparation phase. The purpose of conducting a walkthrough is to ensure that proposed system test procedures adequately describe the operations of the system in accordance with the baselined design and verify the system requirements allocated to the current build. The walkthrough is attended by representatives from development, integration and test, systems engineering, quality assurance, task management, and the customer.

A review package, containing all system test procedures planned for a current build, is distributed at least a week before the scheduled walkthrough date. This allows reviewers sufficient time to prepare comments and questions before the meeting. At the walkthrough, assigned system test personnel provide an overview of test methods, test data, tools, and other resources as necessary for testing the build. Test procedure reviews are driven by comments and questions provided on test execution steps, expected outputs/results and/or success criteria.

4.5 System Test Readiness Review

A system test readiness review is conducted to assess the readiness of the system or system builds, the test environment, and the system test team for starting system test execution. The degree of formality of the TRR depends on the criticality of a system build. Informal TRRs are considered MEBS internal milestones; no formal announcements, presentation or handouts are planned for informal TRRs. The MEBS Task will use software turnover and installation checklists (in lieu of an informal TRR)

from the MODIS SDST Process Manual to assess the test readiness of internal/informal builds. The MEBS I&T will use informal TRR checklists to assess the readiness of the MEBS software integration builds and development prototype. Software integration builds and prototypes will not be turned over and/or promoted to MEBS production/operation.

The MEBS task will conduct a formal TRR for the MEBS system and/or each system build planned to be delivered/released to MEBS production/operations. The MEBS Task will hold a TRR at least two weeks before the scheduled turnover of developed software to CM and/or the system test group. A system test representative will facilitate the review, but the readiness of other areas affecting the start of system testing will be presented by the following groups:

- Software support - software development representative
- Subsystem I&T results - software development or subsystem integration representative
- Test environment - Configuration Management

If the TRR assessment shows that a required element for system testing is not ready, a plan for implementing the corrective action will be established to allow another reassessment before the software turnover.

4.6 Test Execution

The test sets and test cases contained in this test plan provide only high level descriptions of the tests to be performed during the MEBS development. Details for test cases will be provided in the test procedures associated with each system build. All tests are executed as described in the test procedures. DDTs (problem) reports will be generated when discrepancies exist between the expected output and the actual results of the test. Expected output is noted in each test procedure and concurred by the reviewers in the Test Procedure Walkthrough.

The success criteria stated for each test case act as a pass/fail indicator for statistical reporting during system test execution. Success criteria are also concurred by the reviewers at the Test Procedure Walkthrough.

4.6.1 Functional and Performance Tests

Functional tests are defined to verify functional requirements specified in the MEBS requirements specification. Nominal input conditions are defined for every functional requirement test; abnormal input conditions (e.g., incorrect input, incomplete or invalid data) are defined for appropriate and representative tests. Functional tests will be performed for all system builds to review MEBS requirements verification status and to report problems (DDTs reports) to software development. The last two builds (WILT

with V2 science software, and the ETET) will be the primary focus of MEBS functional and performance testing. It is expected that a majority of MEBS requirements will be implemented by these builds, thus allowing gradual and successful verification of the MEBS requirements.

For each given build, functional tests are designed to exercise:

- Newly implemented functions.
- Most used functions.
- Most important functions.
- Complex functions.
- Least tested functions from development.

Performance tests are defined to verify the performance requirements specified in the MEBS requirements specification. These may include, if applicable:

- Individual function performance.
- Overall system performance.
- Data volumes.
- Storage limits.
- Response times.
- System availability.

Similar to the functional test approach, performance tests will be conducted, as appropriate, for all system builds to learn about the capabilities and strength of each increment of the MEBS. However, formal and complete verification of MEBS performance requirements will only be possible when the MEBS software is fully implemented and all required hardware is also available. MEBS performance tests are defined as part of the system integration tests sets.

4.6.2 External Interfaces

External interface tests are defined to verify that the MEBS system can support/meet external system interface requirements specified in either the MEBS requirements specification and/or in external ICDs. External interface tests will be executed, as appropriate, in all builds. Initial builds are expected to utilize interface simulators or simulator generated test data. Later builds are expected to accept and utilize actual data provided by the external systems, as available.

4.6.3 Operational Scenarios

Operational scenario testing is defined to verify the requirements in the MEBS requirements specification that are not fully implemented by either the hardware or the software. These tests are designed to verify the portions of requirements intended for MEBS operators and/or users and the feasibility of operational scenarios and workloads defined in the system design and/or operations concept documents. HILT, DILT, and WILT tests are examples of operational scenario tests for MEBS.

4.6.4 End-to-End Testing

ETETs verify the MEBS capability to support input to output testing. Data is processed through the entire system from the receipt of Level 0 data through PGE processing to output product generation and their transfer to the users. Different scenarios will be established for nominal processing, reprocessing, and processing data with errors, as appropriate. ETET is also used to verify MEBS system integration and performance.

4.6.5 Confidence and Regression Tests

The confidence and regression tests use a baselined set of data to make a quick initial assessment of the latest MEBS software build received and installed in the system test environment. For confidence testing, the data set successfully used in integration testing is also used in system testing to verify that matching/duplicate results and outputs are produced. Otherwise, a failure to produce duplicate results would indicate a problem with either the MEBS software and/or the MEBS environment. Most demonstration of MEBS prototypes and initial builds will rely on confidence tests to assure successful software turnovers to the MEBS CM.

Regression tests are executed for turnovers made after a stable software baseline has been verified (a successful build test) in the MEBS environment. After successful execution of a major MEBS build (e.g., DILT), function test cases may be moved to MEBS regression tests for exercising all future builds. The test data and results associated with a successful build test are configured for reuse in regression test of future software turnovers/build and result comparison. Changes to MEBS software that affect the results of baselined test cases may affect the configured regression tests. This may require the removal and/or suspension of such regression tests until a new test has been configured through a successful build test. Regression tests are repeated, as appropriate, for each new turnover and software delivery to MEBS production to assure the integrity of the as-built and tested MEBS software. The MEBS regression tests may be automated to save test time and resources.

4.7 Verification Methodology

Most MEBS requirements will be verified by test in which expected results derived from the requirements are the basis for assessing actual test results. Those requirements that cannot be verified by testing are verified by either inspection, analysis, or demonstration. The inspection method is typically used for verifying requirements such as: contents of a report against an applicable document, a hardware configuration against a controlled drawing, or the software design against a prescribed standard. The analysis method usually is used, after testing, to verify the performance requirements and to interpret the results. A demonstration method is typically used to verify requirements allocated to operator and user interfaces. The verification methodology for MEBS requirements will be documented, along with test case descriptions, in the MEBS Requirements Verification Matrix. The MEBS Requirements Verification Matrix will be developed and updated by the MEBS I&T lead for the last three MEBS builds (DILT, WILT, and ETET).

4.8 Analysis and Reporting

Most of the analysis performed during the system test phase is a comparison of data files. For builds that employ regression testing, the output files from the newly executed tests are analyzed with respect to the configured output of the regression tests. Output data sets from individual functional tests are analyzed with respect to the input data for both nominal and anomalous data processing. All data generated by the MEBS is collected and analyzed to determine whether the output files meet the established criteria (e.g., compliance to an ICD or data format specification) provided in the test procedures.

After completion of system testing for a build, each test procedure is reviewed for completeness, and the status of its associated requirement(s) is documented in a system requirements verification matrix. The MEBS will use Excel based spreadsheets to track requirements verification status from all builds.

System test progress statistics will be collected and distributed on a daily basis during the test execution phase. These statistics will also be reviewed in the MEBS Task weekly meetings. At the completion of the system test for the current build, a summary report will be generated to document the results of MEBS requirements verification. These summary reports for the MEBS software integration builds and prototype demonstrations will be informal and provided within two weeks of the completion of the test. Formal summary reports will be provided, within four weeks of the completion of system testing, for major system integration builds designated for delivery/release to MEBS production/operations, and will be posted on the MEBS WWW site at URL: <http://ftpwww.gsfc.nasa.gov/MODIS/SDST/mebs>.

Lessons learned from the system test of each software turnover/build will be reviewed with the MEBS project and documented in the summary reports, as well.

4.9 Anomaly Reporting and Change Control

Any tests outlined in this test plan that fail to generate expected results may be rerun to verify that, if a problem exists, it can be recreated and the test results remain the same. A DDTs (problem) report will be initiated for all such problems. Problems that are not repeatable are still documented by DDTs reports and noted as not repeatable to help post-test analysis and correction of the problem, as appropriate. DDTs reports will only be documented for problems noted during formal system tests of system integration builds. MEBS Software development will internally track and correct all problems found during testing of software integration builds (e.g., MEBDOS software integration tests).

Problems found during system testing will be resolved by interim builds, if necessary, or by the next scheduled build. The MEBS Configuration Control Board will meet at least on a weekly basis to review the status of the DDTs reports and to make timely decisions on the disposition of software and system problems. The MEBS CCB will be responsible for deciding whether to request an emergency patch or interim software/build turnover to resolve the current build problems. No changes will be made to the system test baseline (software under test) without a formal turnover of configured software.

4.10 Requirements Traceability

To ensure that all MEBS requirements are addressed and verifiable during system testing, each requirement is assigned at least one test case in the requirements traceability matrix. The top level MEBS build tests to requirements traceability matrix is shown in Table 1-1 of this test plan and is maintained using an Excel spreadsheet. This table will be continually updated at the end of each system integration build test and reported in the formal summary reports. A MEBS requirements verification Matrix, completed as appropriate, will also be included in the MEBS delivery/release package.

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5. CONFIGURATION AND DATA MANAGEMENT

This section describes the Configuration Management and Data Management activities that pertain to testing the MEBS software turnovers/builds. The MEBS system test group, with some support from MEBS software development group and the MODIS SDST project CM, will primarily be responsible for most MEBS configuration control activities.

The MEBS software development group will be responsible for the internal and informal configuration management of the MEBS software under development and during software integration. A designated MEBS CM person (from the MEBS system test group) will be responsible for receiving the software turn over, configuring it using the ClearCase tool, constructing a software build, and installing it in the system test environment. The turnover software will remain in the MEBS system test CM environment until it is satisfactorily tested in accordance with the success criteria documented in the procedures. The tested MEBS software will be available for promotion to the MEBS production CM environment when approved by the MEBS Task Manager and the SDST Leader.

5.1 Test Tools

MEBS test personnel will be responsible for acquiring, configuring and maintaining all test tools, required for software integration and system tests, in the MEBS tools library. The MEBS will obtain these tools from the MODIS SDST CM library and maintain these in the MEBS library to ensure independence from SDST CM plans and potential changes. This separation of the CM libraries is also expected to help MEBS avoid tool version problems, during system testing, which may be caused by the lag between MEBS and SDST tool version requirements.

MEBS uses the HDF tool-kit for reviewing output files and procedures written in Image Description Language (IDL) for displaying MEBS produced browse and thumbnail images.

5.2 Test Data

The MEBS system test group will validate, configure, and associate all required test data with each MEBS build. This is to endure that MEBS system tests can be easily repeated for each individual build to support the analysis of the problems noted in the DDTs reports. A designated MEBS test person will be responsible for acquiring, developing, generating, and maintaining all test data required throughout the development of MEBS. The MEBS system test personnel needing the test data will be responsible for validating the test data for their assigned system tests. They will also be responsible for turning over the validated test data to the MEBS CM before the start of their tests, and qualified test data after successful completion of the tests.

5.3 Test Environment

The MEBS system engineering group, with support from MEBS system test, software development, and system administration, is responsible for the definition, setup, and verification of the test environments for the scheduled builds,. A system test environment consists of hardware elements, system software, and COTS products including the operating system, database, and interface software not part of the MEBS application software.

The MEBS CM will be responsible for documenting each test environment, via a checklist audit, prior to the start of each system build test. The MEBS test environment is considered a configured system environment; therefore, all required changes to this environment should be documented via a CCR.

5.4 Software Turnovers

The MEBS task will use procedures and forms contained in Section 8 of the MODIS SDST Process Manual (Reference document i) for all MEBS software turnovers. The following notes provide additional information for conducting MEBS software turnover activities.

1. The MEBS System Integration and Test will also be responsible for MEBS Configuration Management. The system integration lead will be the technical point of contact and Configuration Management Officer (CMO) for all MEBS software turnover activities. He/She will be supported by the system integration and test lead for managing turnover activities. For making formal software delivery to the MODIS Project at GSFC, the MEBS I&T will be the Formal CMO for MEBS. He/She will coordinate with the MODIS SDST CMO for making MEBS deliveries.
2. The Development Lead will prepare MEBS software turnovers in accordance with the process and forms contained in the MODIS SDST Process Manual, Section.
3. The Development Lead will conduct a demonstration of the "turnover" software, from directories in the "Development" environment, to the MEBS System Integration and Test Group. Problems discovered during this demonstration are expected to be resolved by Development before submitting the turnover to the System I&T Lead.
4. Development provides all newly developed software on a tape or a TAR file in a "Development Directory" readable by the System I&T/CM person. Development should identify directory locations of all other software required with the turnover for the MEBS software build. Development also provides a completed turn over form to the MEBS I&T/CM person.
5. The MEBS I&T/CM person puts the "turned-over" software in "Test" CM (under ClearCase) after successful installation in the test environment.
6. MEBS testers test the "turned-over" build in the "Test" CM environment in accordance with pre-defined procedures. They document all tests results and

problems in accordance with the forms and procedures contained in the MODIS SDST Process Manual.

7. MEBS testers log and enter all “turnover” build problems in the DDTs database. The Development Lead is responsible for providing corrections to “turnover” problems in accordance with their severity. System test receives corrections from the Development if absolutely necessary to proceed with the test. Otherwise, the system I&T Lead may decide to complete all testing of the turned-over build without receiving any corrections.
8. The System I&T Lead generates a report on the results and problem of the turned-over build. A demonstration of the “tested” build may also be provided upon request from the MEBS Task Manager.

5.5 Delivery Packaging

The preparation of the delivery package, if required for MEBS, is a team effort involving Software Development, Systems Engineering, Configuration Management, Quality Assurance, and Integration and Test personnel. Usually a pre-defined turnover/build (internal software delivery to CM/I&T) is chosen as the draft package for MEBS delivery. The selected draft turnover package is controlled and maintained by MEBS CM. It is reviewed, adjusted/augmented by the software and I&T groups for completeness and accuracy, updated by CM per supplied instruction and turnover corrections, and regression tested for reliability. After verification testing of the turnover, a final delivery package (software and documentation) is produced by CM. The final package is reviewed by QA before its delivery to the customer.

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6. TEST DESIGN AND SPECIFICATION

6.1 System Test Sets [Core Functional Tests]

The following section describes the test sets for system testing. The term Assumed Derived Requirement (ADR) is used in the following test specifications to indicate that no direct MEBS requirement was identified and ADR is used to define a complete test scenario.

6.1.1 Test Set 1 - Level 0 Data Ingest and Archive

Purpose: To ensure that Level 0 data is received from EDOS and stored in the MEBS archive.

Dependencies: The data ingest test depends on MEBS scheduler for the automated start of LEVEL 0 to L1A processing. Also, data ingest tests are expected to run in conjunction with MEBS archive and Product Generation test (operations).

EDOS interface may be simulated by on-line Level 0 data set, in tests before the Version 2 WILT.

External/Test Data Inputs Required: Two Simulated orbit's worth of MODIS LEVEL 0 data sets in EDOS format with consecutive times and no errors.

Expected Output:

- Received LEVEL 0 granules (files) (Requirement 3.1-1)
- L1 A output Granules/products

Resources Required:

- modis-xl -- Source computer for simulated Level 0 files
- modular -- Data processing computer
- LEVEL 0 Ingest software with metadata extractor
- Archive Software
- MEBS Scheduler for automated start of LEVEL 0 to L1A processing
- Product Generation software and/or scripts
- Product Generation Executive 01 (PGE01)

- EDOS interface or simulated Level 0 test data set(s) in EDOS format
- MEBS operator Interface

Test Methods: Functional, interface, and performance tests verified by test execution and inspection.

MEBS Req.	Test Case	Test Description	Additional Results
3.1-1, 3.1-1.1	S1-01	Start/Verify MEBS operations for automated receipt of Level 0 data from EDOS.	Verification/log entry that MEBS is ready for automated receipt. Verification that adequate disk storage space is available for receiving a new Level 0 data set.
3.1-1	S1-02	Receive and ingest one orbit's worth of MODIS Level 0 Data from EDOS (EDOS Push).	Log entry that new Level 0 data is received.
3.3.1-1	S1-03	Perform automated/scheduled operations for processing of received Level 0 data to L1A/GEO granule products using PGE01.	Log entry that LEVEL 0 to L1A processing has started . Expected output products/granules.
3.1-1.2 (ADR)	S1-04	a. Catalog/Archive Level 0 data. b. Catalog/Archive output L1A/GEO files/granule products.	a1. Log entry that Level 0 file has been archived. a2. Product Catalog/Archive listing of newly received Level 0 data set. b1. Log entry that L1A files have been archived. b2. Product Catalog/Archive listing of newly archived/ products/granules.
(ADR)	S1-05	Repeat Test Cases S1-02, S1-03, and S1-04 for receipt, processing and archive of a second Level 0 data set from EDOS.	Verification that a second Level 0 ingest can be started when the first Level 0 data set is being processed to L1A. Verification that two sets of L1A files are processed and archived.
(ADR)	S1-06	Delete Level 0 files from MEBS data ingest storage or the staging area.	Verification/Log entry that Level 0 files are deleted [more ingest disk space is available for new/next Level 0 data set(s)].

6.1.2 Test Set 2 - Ancillary and Ephemeris Data Ingest and Archive

Purpose: To ensure that Ancillary data is received from the GSFC DAAC and/or National Meteorological Center (NMC), TOMS and Data Assimilation Office (DAO) **[To Be Resolved before closure (TBR)]** and stored in the MEBS archive.

Dependencies: The Ancillary data ingest test depends on MEBS scheduler for scheduled receipt (pull) of files from the GSFC DAAC and/or the ancillary data providers. Also, the data ingest tests are expected to run in conjunction with MEBS archive and Product Generation tests (operations).

Ancillary data provider interface(s) may be simulated by on-line Ancillary test data set(s).

External/Test Data Inputs Required: Two simulated ancillary test data sets, corresponding to the simulated Level 0 test data used in System Test set 1, and with no errors.

Expected Output

- Received Ancillary data files archived in MEBS

Resources Required:

- **modis-xl** -- Source computer for simulated Ancillary files
- **modular** -- Data processing computer
 - Ancillary data ingest software with metadata extractor
 - Archive Software
 - MEBS Scheduler for automated pulls of ancillary data files
 - Product Generation software and/or scripts
 - Ancillary data provider interface(s) simulator or simulated Level 0 test data set(s)
 - MEBS operator Interface

Test Methods: Functional, interface, and performance tests verified by test execution and inspection.

MEBS Req.	Test Case	Test Description	Additional Results
3.1-2, 3.1-2.1, 3.1-2.3	S2-01	Start/Verify MEBS operations for scheduled receipt of ancillary data from GSFC DAAC / Providers.	Verification/log entry that MEBS is ready for scheduled receipt. Verification that adequate disk storage/staging space is available for receiving new ancillary data sets.
3.1-2, 3.1-2.1, 3.1-2-3	S2-02	Perform an automated/scheduled operation to receive and ingest an ancillary data file from GSFC DAAC or a Provider. (MEBS Pull).	Log entry that a new ancillary data file is received in MEBS.
3.1-2.2	S2-03	Store/Stage the received ancillary file in MEBS (to make it available for stream processing).	Log entry that the ancillary file is stored/staged and available.
3.1-2.2	S2-04	Schedule a stream run to use the received ancillary data file.	MEBS/Scheduler log
3.1-2-4	S2-05	a. Catalog/Archive received ancillary data file.	a1. Log entry that ancillary file has been archived. a2. Product Catalog/Archive listing of newly received ancillary file.
3.1-2	S2-06	Repeat Test Cases S2-02 through S2-05 for receiving, storing/staging and archiving an ancillary data file from each provider.	Verification that the ancillary file ingest process can be repeated for each ancillary data provider.
(ADR)	S2-07	Repeat Test Cases S2-02 through S2-05 for receiving, storing/staging and archiving ephemeris data from Flight Dynamics Facility (FDF).	Verification that ephemeris data can be received from FDF, stored, and archived in MEBS.
3.1-2	S2-08	Repeat Test Cases S2-02 through S2-05 for simultaneously receiving, storing/staging and archiving of ancillary data files from all data providers.	Verification that ancillary files from multiple providers can be simultaneously received, staged, and archived.
(ADR)	S2-09	Repeat Test Cases S2-02 through S2-05 for simultaneously receiving, storing/staging, and archiving ancillary data files from all data providers while Level 0 ingest and archive is also active (Test Set S1).	Verification that ancillary files from multiple providers can be simultaneously received, staged, and archived during Level 0 data ingest and archive operations.
(ADR)	S2-10	Delete ancillary data files from MEBS data ingest storage or the staging area after archiving.	Verification/Log entry that ancillary files are deleted [more ingest disk space is available new/next Level 0 data set(s)].
(ADR)	S2-11	Attempt to delete ancillary data files from MEBS data ingest storage or the staging area while the archive is down.	Verification/Log entry that ancillary files are NOT deleted if the archive fails.

6.1.3 Test Set 3 - Normal Product Generation

Purpose: To ensure that ingested Level 0 and/or archived L1A data is processed to generate MODIS products/granules using SDST's defined schedules/recipes and MEBS integrated PGEs.

Dependencies: This test depends on the availability of L1A products/granules in the archive. Also, it requires pre-defined scripts/recipes for MEBS scheduling and processing selected PGEs/granules for generating desired output products/granules. The normal data production test may also be run in conjunction with Level 0 ingest and archive and Ancillary and Ephemeris data ingest archive tests to demonstrate concurrence of MEBS operations.

External/Test Data Inputs Required:

Level 0 data available in Ingest storage

L1A product granules and ancillary and ephemeris data from ingest test sets.

MEBS defined scripts/recipes for production schedules

Expected Output

MEBS/MODIS output products/granules (see Appendix B)

Resources Required:

- modis-xl -- Source computer for simulated test data (Level 0 and L1A, as required)
- modular -- Data processing computer with a minimum of 16 CPUs
- MEBS Archive Software
- MEBS Scheduler for automated science data processing operations
- Product Generation software and/or scripts
- Product Generation Executives (PGEs)
- MEBS operator Interface

Test Methods: Functional and performance tests verified by test execution and inspection.

MEBS Req.	Test Case	Test Description	Additional Results
3.2, 3.3-1.1	S3-01	Initiate and/or verify that the scheduler is set up for "one-to-many granule" processing per a pre-defined schedule/recipe. PGE to Process: 1	Display and verify the setup and/or generation of a schedule per a defined recipe.
3.2, 3.3-1.2	S3-02	Initiate and/or verify that the scheduler is set up for "granule-based processing" per a pre-defined schedule/recipe. PGEs to process: 2, 3, 4, 6, 7, 8, 9, 10, 11, 17, 19.	Display and verify the setup and/or generation of a schedule per a defined recipe.
3.2, 3.3-1.3	S3-03	Initiate and/or verify that the scheduler is set up for "dynamic ancillary input files" processing per a pre-defined schedule/recipe. PGEs to process: 2, 3, 6, 9, 10, 11, 16, 17, 18, 19.	Display and verify the setup and/or generation of a schedule per a defined recipe.
3.2, 3.3-1.4	S3-04	Initiate and/or verify that the scheduler is set up for "L2G processing" per a pre-defined schedule/recipe. PGEs to process: 12, 13, 14, 15	Display and verify the setup and/or generation of a schedule per a defined recipe.
3.2, 3.3-1.5	S3-05	Initiate and/or verify that the scheduler is set up for "L2 to L3" processing per a pre-defined schedule/recipe. PGEs to process: 5, 9, 10, 16	Display and verify the setup and/or generation of a schedule per a defined recipe.
3.2, 3.3-1.6	S3-06	Initiate and/or verify that the scheduler is set up for "L3 Aggregation" processing per a pre-defined schedule/recipe. PGEs to process: 25, 26, 29, 34, 49, 50.	Display and verify the setup and/or generation of a schedule per a defined recipe.
3.2, 3.3-1.7	S3-07	Initiate and/or verify that the scheduler is set up for "L3 and L4 Modeling" processing per a pre-defined schedule/recipe. PGEs to process: 14, 15, 43, 44	Display and verify the setup and/or generation of a schedule per a defined recipe.
3.2, 3.3-1.8	S3-08	Initiate and/or verify that the scheduler is set up for "L3 Resampling" processing per a pre-defined schedule/recipe. PGE to process: 26.	Display and verify the setup and/or generation of a schedule per a defined recipe.
3.2, 3.3-1.9	S3-09	Initiate and/or verify that the scheduler is set up for "file/Product updating" processing per a pre-defined schedule/recipe. PGE to process: 22.	Display and verify the setup and/or generation of a schedule per a defined recipe.
3.2, 3.3-1.10	S3-10	Initiate and/or verify that the scheduler is set up for "L3 input to L2" processing per a pre-defined schedule/recipe for V2 software only. PGE to process: 11.	Display and verify the setup and/or generation of a schedule per a defined recipe.
3.2, 3.3-1.11	S3-11	Initiate and/or verify that the scheduler is set up for "L3 reference file" processing per a pre-defined schedule/recipe. PGE to process: 53.	Display and verify the setup and/or generation of a schedule per a defined recipe.
3.2, 3.3-1.12	S3-12	Initiate and/or verify that the scheduler is set up for "granule-based processing with extended time range" processing per a pre-defined schedule/recipe. PGE to process: 2.	Display and verify the setup and/or generation of a schedule per a defined recipe.

MEBS Req.	Test Case	Test Description	Additional Results
3.2, 3.3-2	S3-13	Initiate and/or verify that the scheduler is set up for "L1A Subsampled files" processing per a pre-defined schedule/recipe. PGE to process: 2.	Display and verify the setup and/or generation of a schedule per a defined recipe.
3.2, 3.2-1	S3-14	Initiate and/or verify that the scheduler is set up for "high-priority region" processing per a pre-defined schedule/recipe. PGE to process: 2.	Display and verify the setup and/or generation of a schedule per a defined recipe.
3.2	S3-15	Ensure that all processing schedules are defined and chained per the product generation sequence order shown in Appendix C.	Display and verify normal product generation processing sequence.
3.2,3.2-1, 3.3-1, 3.3-1.1, 3.3-1.2, 3.3-1.3, 3.3-1.4, 3.3-1.5, 3.3-1.6, 3.3-1.7, 3.3-1.8, 3.3-1.9, 3.3-1.10, 3.3-1.11, 3.3-1.12, 3.3-2, 3.4-1, 3.4-2	S3-16	Verify that automated MODIS product generation operations are started in accordance with pre-defined schedules/recipes and available product/granules.	Display/verify the execution status of pre-defined and scheduled recipes.
3.2-1, 3.3-1, 3.4-1, 3.4-2	S3-17	Verify that available product/granules with "high-priority regions" defined in their schedules/recipes are processed before other granules without the high priority regions defined in their schedules.	N/A

MEBS Req.	Test Case	Test Description	Additional Results
3.2, 3.2-1, 3.3-1, 3.3-1.1, 3.3-1.2, 3.3-1.3, 3.3-1.4, 3.3-1.5, 3.3-1.6, 3.3-1.7, 3.3-1.8, 3.3-1.9, 3.3-1.10, 3.3-1.11, 3.3-1.12, 3.3-2, 3.4-1, 3.4-2	S3-18	Verify that automated MODIS product generation operations are completed in accordance with pre-defined schedules and available product/granules.	Display/verify the execution status of pre-defined and scheduled recipes.
3.2,3.2-1, 3.2-2.2, 3.3-1, 3.3-1.1, 3.3-1.2, 3.3-1.3, 3.3-1.4, 3.3-1.5, 3.3-1.6, 3.3-1.7, 3.3-1.8, 3.3-1.9, 3.3-1.10, 3.3-1.11, 3.3-1.12, 3.3-2, 3.4-1, 3.4-2	S3-19	Verify that output products/granules are generated in accordance with the list. shown in Appendix C.	N/A
3.7-5 3.7-6	S3-20	Catalog and archive output products/granules generated during normal product generation operations (Test Case S3-19).	Display and verify Product Catalog: a. Time range for each product b. geographic range for each product. c. one entry for each data set

6.1.4 Test Set 4 - High-Priority Region/Deferred Data Processing

Purpose: To ensure that available product/granules matching high priority regions in the schedule/script are processed before those products/granules not matching the high priority scheduling/processing criteria. This test set should only be performed when the results from high-priority region and deferred data processing (Test case S3-17) under the “Normal Product Generation” test set (S3) are ambiguous.

Dependencies: This test uses the high-priority region processing test cases from the Normal Data Production test case (S3).

External/Test Data Inputs Required:

- MODIS product granules and ancillary and ephemeris data as required.
- Two SDST test e-mail messages for processing the same input granule; one defined to process a high-priority region and the other to process a region that is not high-priority.

Expected Output

- MODIS output products/granules

Resources Required:

- modisdsm -- Source computer for MEBS World Wide Web interface
- modis-xl -- Source computer for simulated test data
- modular -- Data processing computer with a minimum of 16 CPUs
- MEBS Archive Software
- MEBS Scheduler for automated science data processing operations
- Product Generation software and/or scripts
- Product Generation Executives
- MEBS Operator Interface

Test Methods: Functional and performance tests verified by test execution and inspection.

MEBS Req.	Test Case	Test Description	Additional Results
3.2, 3.2-1	S4-01	Receive a message from the SDST staff and construct a "High-priority region" processing schedule/recipe.	Display and verify the generation of a "High-priority region" processing schedule/recipe per received message.
3.2, 3.2-1	S4-02	Receive a message from the SDST staff and construct a processing schedule/recipe "without a High-priority region" or a "Deferred" processing schedule/recipe.	Display and verify the generation of a "Deferred" processing schedule/recipe per received message.
3.2, 3.2-1, 3.4-1, 3.4-2	S4-03	Verify that automated MODIS product generation operations are first started and completed for the "High-priority Schedule"; then for the "Deferred Schedule".	N/A
3.2-1, 3.3-1, 3.4-1, 3.4-2	S4-04	Verify that an available product/granule is processed two times, first in accordance with the "HiPri Schedule" and then in accordance with the "DeferRed Schedule".	N/A

6.1.5 Test Set 5 - Anomalous Data/Condition Processing/Recovery

Repeat the following test sets with erroneous test data as inputs:

Test Set 51. System Test Set 1 - Level 0 Data Ingest and Archive

Test Set 52. System Test Set 2 - Ancillary and Ephemeris Data Ingest and Archive

Test Set 53. System Test Set 3 - Normal Product Generation

Test Set 54. High-priority Region/Deferred Data Processing

Verify, for each test set, that MEBS can detect, recover (continue to process without MEBS failure) and alert operator of the presence of the following anomalous data conditions (**TBR** by MEBS project to determine and agree to system/data recovery performance requirements):

- a) Missing Level 0 Data file
- b) Missing Level 0 Data
- c) Corrupted Level 0 Data
- d) Missing Ancillary Data file
- e) Missing Ancillary Data
- f) Corrupted Level 0 Data

- g) Missing Ephemeris Data file
- h) Missing Ephemeris Data
- i) Corrupted Level 0 Data
- j) Missing PGEs and/or processes
- k) Failed PGEs and/or processes
- l) Missing interim products required during processing
- m) Missing metadata
- n) System Power Failure Detection and Recoveries
- o) System/Database backup and recovery
- p) Hardware Failure Detection and Recovery

6.1.6 Test Set 6 - MEBS Data Ordering and Distribution

Purpose: To ensure that MEBS users can successfully register themselves and order MODIS products from MEBS. This test also verifies the availability of browse images to logged users. Browse images are typically on-line and downloaded via FTP when a user clicks on the thumbnail of the browse image.

Dependencies: MODIS output products must be available from the Normal Product Generation test set.

External/Test Data Inputs Required:

- User inputs via the World Wide Web Interface for user registration, product searches, and product/data ordering.
- MODIS Science Team (MST) inputs or test data for constructing standing orders.
- Product Catalog
- MEBS Archive (product storage)

Expected Output

- Registered users information in MEBS database
- Product/data search results/product orders in MEBS database
- Annotated product/data orders to users
- MODIS Products, via FTP or tape

Resources Required:

- modisdms -- Source computer for MEBS World Wide Web interface
- modis-xl -- Source computer for simulated test data
- modular -- Data processing computer with a minimum of 16 CPUs
- MEBDOS Software
- MEBS Archive Software
- MEBS Scheduler for periodically executing standing orders
- MEBS Operator Interface
- E-mail message interface with users
- At least two MEBS user interface workstations (for MEBS user simulation)

Test Methods: Functional, interface, and performance tests verified by test execution and inspection.

MEBS Req.	Test Case	Test Description	Additional Results
3.6-4	S6-01	Allow remote registration by two new users (MST and User#1) into MEBS.	Verify that new users receive confirmation messages regarding their registration (via web page update).
3.6-4	S6-02	Display registration of new/all users to MEBS operator	N/A
(ADR)	S6-03	Allow addition of (two) new sites by each registered user (site = bounding box for data ordering)	Display and verify current sites for each registered user.
(ADR)	S6-04	Allow deletion of (one) current site by each registered user.	Display and verify that deleted sites are no longer current for the users.
3.6-7, 3.6-2	S6-05	Create standing orders for MODIS products/granules listed in Appendix C. - tape and FTP deliveries - 1 -3 day expiration dates	Display and verify all standing orders.
3.6-1.1	S6-06	Allow product catalog searches by registered users using any combination of the following attributes: - Product ID - Time range - Latitude and Longitude Bounding box - Products without flaws - Product version - Day and night Products	N/A

MEBS Req.	Test Case	Test Description	Additional Results
(ADR)	S6-07	Allow creation and submittal of product orders based on product catalog searches by the users: a. append to currently open orders b. open a new product order.	N/A
3.6-5	S6-08	Allow modification of open product orders by users: - Tape and FTP deliveries - Expiration dates/duration (dates or time range?)	N/A
3.6-5	S6-09	Allow deletion of open product orders by users.	N/A
3.6-6, 3.6-7	S6-10	Perform automated processing of all standing orders and notify users when products are ready for distribution.	Verify receipt of notification by users owning standing orders.
3.6-2	S6-11	Distributed (FTP Push) MODIS products to users (MST) for processed standing orders (Push for product/user orders, as well).	Verify receipt of products by standing order users (MST).
3.6-2, 3.6.4	S6-12	Distribute MODIS products via tape shipments in accordance with order criteria.	Verify that tapes for shipping are identified/addressed by operator supplied labels.
3.6-6	S6-13	Perform automated processing of all product orders and notify users when products are ready.	Verify receipt of notification by users owning product orders.
(ADR)	S6-14	Receive and respond to user inquiries regarding order status (product orders and standing orders?)	N/A
3.6-2.3	S6-15	Receive and process user requests to download (FTP pull) ordered products ready for distribution.	N/A
3.6-1 3.6-2.1	S6-16	Allow searching and browsing of MODIS products/granules, available in MEBS archive, to (FTP) users using any combination of the following criteria: - Product ID - Bounding Box - Time Range - Since Date/Time in database - Day or Night indicator - Flaws indicator	N/A
3.6-2.1	S6-17	Allow downloading (FTP pull) of MODIS products/granules, available in MEBS archive, to browsing users.	N/A

6.1.7 Test Set 7 - Browse Image Generation

Purpose: To demonstrate the generation of browse images by MEBS.

Dependencies: This test requires the availability of the following MODIS product data sets for generating browse images:

- Surface Reflectance
- L3 sampled every 10th pixel and line
- Global composite of same

Thumbnail images are then produced from browse images.

External/Test Data Inputs Required:

MODIS products/granules from Normal Product Generation test set.

Expected Output

- A browse image for a selected MODIS product
- A thumbnail image from each browse image

Resources Required:

- modisdms -- Source computer for MEBS World Wide Web interface
- modis-xl -- Source computer for simulated test data.
- modular -- Data processing computer with a minimum of 16 CPUs
- MEBDOS/Product Generation Software
- MEBS Archive Software
- MEBS Scheduler for automated browse image generation
- Browse image generation software and/or scripts
- Product Generation Executives
- MEBS Operator Interface

Test Methods: Functional and performance tests verified by test execution and inspection.

- Execute these test cases while EDOS Level 0 ingest and archive, Ancillary and Ephemeris data ingest and archive, MEBS product generation, MEBS data ordering, and data distribution test/operations are all active.

MEBS Req.	Test Case	Test Description	Additional Results
3.6-3, 3.6-3.1 (ADR)	S7-01	Perform automated/scheduled operations to generate browse images from selected MODIS Products.	A browse image is produced each time a selected MODIS Product is generated (frequency).
3.6-3.2	S7-02	Perform automated/scheduled operations to generate a thumbnail image (at a lower resolution) for each browse image produced for a selected Product.	N/A
(ADR)	S7-03	Catalog and store browse images on-line.	N/A
(ADR)	S7-04	Catalog and store thumbnail images on-line	N/A
(ADR)	S7-05	Provide/Download (FTP push) browse images to MEBS users logged on to the MEBS WWW site.	N/A
(ADR)	S7-06	Provide/Download (FTP push) thumbnail images to MEBS users logged on to the MEBS WWW site.	N/A

6.1.8 Test Set 8 - MEBS Production Monitoring and Metrics

Purpose: To demonstrate that MEBS allows the monitoring of EDOS data ingest, MODIS product generation, browse image generation, and data distribution operations by the operator.

Dependencies: This test is run in conjunction with all other test sets.

External/Test Data Inputs Required:

- Operator prompt as necessary to monitor MEBS operations.

Expected Output

- MEBS overall status
- Product generation status of any stream (PGEs in a single product generation thread).
- PGE processing log
- MEBS disk and CPU utilization status

Resources Required:

All as required for MEBS normal operations noted in previous test sets.

Test Methods: Functional test verified by test execution, demonstration and inspection.

MEBS Req.	Test Case	Test Description	Additional Results
3.4-1	S8-01	Monitor/display the status of a waiting schedule/recipe for a production stream (string of PGEs).	N/A
3.4-1	S8-02	Monitor/display the status of an active production stream.	N/A
3.4-1	S8-03	Monitor/display the status of a completed production stream.	N/A
3.4-2	S8-04	Monitor/display the overall status (up/down) of the resources allocated to MEBS: <ul style="list-style-type: none"> - Allocated processors - RAID disks - Data storage archive - Local Area Networks (LANs) - Gateway and Router links - Workstations 	N/A
3.4-3	S8-05	Display PGE log, during product generation test set, to show: <ul style="list-style-type: none"> - Started PGE with data set name and start time 	N/A
3.4-4	S8-06	Display PGE log, during product generation test, to show: <ul style="list-style-type: none"> - Started PGE with data set name, end time, CPU resources utilized, final status code, location of associated QA and log files. 	N/A
3.4-5	S8-07	Display available disk space and CPU resources during Level 0 data ingest, product generation and data distribution tests (MEBS ordering).	N/A
3.5-1	S8-08	Display/print summary information (timing and error codes/counts) for generated products.	N/A

6.2 System Integration Test Sets [Threaded Core/Functional Tests]

As required by the MEBS System Requirement Specification (Section 5), the MEBS will go through three stages of system/software integration and qualification testing to assure that MEBS will be ready to support MODIS Algorithm Validation following AM-1 launch. The three stages of the system integration test include the HILT, DILT, and ETET. These tests verify the gradual integration of MODIS Product Generation Executives (PGEs) and the resulting increase in MEBS/PGE production capability. WILT test sets are added to MEBS test plan to facilitate a smoother integration of PGEs through their transition from V1 to V2 of the MODIS Science Data Processing Software (SDPS). Table 6-1 lists the MODIS PGEs allocated to MEBS system integration test sets. In all, the following system integration test sets are proposed for MEBS qualification:

- System Integration Test Set 11 - HILT
- System Integration Test Set 12 - DILT
- System Integration Test Set 13- WILT - Version 1
- System Integration Test Set 14 - WILT - Version 2
- System Integration Test Set 15 – ETET
- System Integration Test Set 16 - Data Reprocessing (Data Versioning)
- System Integration Test Set 17 - Workload Processing Performance
- System Integration Test Set 18 - MEBS Resources Allocation [to MODIS Characterization Support Team (MCST), SDST, and Test]

Due to the critical nature of MEBS requirements allocated to System Integration Test Sets 6, 7, and 8, they are intentionally described separately to assure their qualification to support operations. It is quite likely that the MEBS capabilities required for these test sets will be available as part of the last build planned to demonstrate the MEBS “end-to-end” operations. As a result, System Integration Test Sets 6, 7, and 8 could very well be included with System Integration Test Set 5 ETET or executed immediately after its completion.

Table 6-1. Allocation of PGEs to MEBS System Integration Tests

SI Test Set	Category	PGE Numbers
HILT	Atmosphere	1, 2, 3, 4
	Land	1, 2, 3, 4, 7, 11
	Ocean	1, 2, 3, 9, 10
DILT	Atmosphere	1, 2, 3, 4, 5, 6
	Land	1, 2, 3, 4, 5, 6, 7 8, 11, 12, 13, 14, 15, 16, 22, 33, 43, 44
	Ocean	1, 2, 3, 9, 10, 17, 19, 20
WILT - Version 1	Atmosphere	DILT
	Land	DILT, 25, 26, 29, 34, 37, 45, 47
	Ocean	DILT, 49, 50, 51, 53, 54
WILT - Version 2	Atmosphere	All V2 PGEs as delivered and integrated for this test (List TBD)
	Land	All V2 PGEs as delivered and integrated for this test (List TBD)
	Ocean	All V2 PGEs as delivered and integrated for this test (List TBD)
ETET	Atmosphere	WILT-V2
	Land	WILT-V2
	Ocean	WILT-V2

The planning details for the MEBS System integration test sets are provided in the following sections.

6.2.1 Test Set 11 - Hour-in-the-Life Test

Purpose: Demonstrate MEBS L1 and L2 [no Level 2 Gridding (L2G) data production capability, using the MODIS SDPS and Scheduler, from an orbit's worth of MODIS Level 0 data.

Dependencies:

- A GUI is required for this test
- MODIS SDPS V1 PGEs: See Table 6-1 for allocation to this test set.
- Tools: utility, prostat, vdmon, and ingest monitor

External/Test Data Inputs Required:

- Three (3) Simulated LEVEL 0 granules with consecutive times and no errors.

Expected Output

- Received LEVEL 0 granules (files)
- L1 A output Granules

Resources Required:

- modis-xl -- Source computer for simulated Level 0 files, properly formatted e-mail messages
- modular -- Data processing computer

Test Methods: Functional tests verified by test execution, demonstration and inspection.

MEBS Req.	Test Case	Test Description	Additional Results
5.1-1	S11-01	Request receive and ingest of Level 0 files.	N/A
5.1-1	S11-02	Receive and Ingest Level 0 Data equivalent to one AM_1 orbit.	N/A
5.1-1	S11-03	Archive Level 0 Data.	N/A
5.1-1	S11-04	Automatically start the processing of received Level 0 data.	N/A
5.1-1	S11-05	Process Level 0 granule using PGE01 to generate L1A/GEO products.	Verify that expected output products and number of granules are generated.
5.1-1	S11-06	Process day mode granules using PGE02, PGE03, PGE04, PGE06, PGE07, PGE09, PGE10, and PGE11. Process night mode granules using PGE02, PGE03, PGE10, and PGE11.	N/A
5.1-1	S11-07	Review processing status of a couple of PGEs.	Verify that multiple PGEs process in parallel.
5.1-1	S11-08	Request receive and ingest of Level 0 data at two hour intervals.	N/A
5.1-1	S11-09	Repeat Test Cases System Integration (SI) SI-02 through SI-08 for each received Level 0 data.	N/A

6.2.2 Test Set 12 - Day-in-the-Life Test

This test is similar to the “Hour in the Life” test but expanded to include the processing of additional PGEs as shown in Table 6-1 and executed to process the Level 0 data acquired over a period of one day or equivalent. This test set satisfies MEBS Requirement 5.1-2.

6.2.3 Test Set 13 - Week-in-the-Life Test - Version 1

This test is also similar to the “Day in the Life” test but expanded to include the processing of additional PGEs as shown in Table 6-1 and executed to process the Level 0 data acquired over a period of one week or equivalent. This test uses V1 of the MODIS software and/or PGEs in the MEBS implementation. This test is a precursor to the Version 2 “Week in the Life” Test (MEBS Requirements 5.1-3) which will demonstrate MEBS capability to process and archive weekly products.

6.2.4 Test Set 14 - Week-in-the-Life - Version 2

This test is also similar to the DILT test but expanded to include the processing of additional PGEs as shown in Table 6-1 and executed to process the Level 0 data acquired over a period of one week or equivalent. This test uses V2 of the MODIS software and/or PGEs in the MEBS implementation. This test satisfies MEBS Requirement 5.1-3 and demonstrates the MEBS capability to produce all MEBS products (MEBS Requirement 3.3-1), archive, and retrieve them. It should demonstrate all MEBS functionality with the exception of external interfaces to EDOS and GSFC DAAC if these are not available.

6.2.5 Test Set 15 - End-to-End Test

This test is also similar to the WILT test but expanded to include the processing of additional PGEs as shown in Table 6-1 and executed to process the Level 0 data acquired over a period of one month or 32 days. This test uses V2 of the MODIS software and/or PGEs in the MEBS implementation. In addition, MEBS interface tests with EDOS, ancillary data providers, and MEBS users are also conducted. This test satisfies MEBS Requirement 5.1-4 and should demonstrate the complete functionality of MEBS (data production, data archive, browse generation, data ordering, and data distribution).

MEBS Req.	Test Case	Test Description	Additional Results
5.1-3	S15-01	a. System Setup: <ul style="list-style-type: none"> • Startup MEBS (if shut down for any reason). • Verify MEBS setup for Normal Operations. • Verify LEVEL 0 Data ingest (EDOS Push) schedules for the day. • Verify Ancillary Data ingest (MEBS FTP/Pull) schedules for the day. 	N/A
5.1-3	S15-02	a. Data Ingest Operations: <ul style="list-style-type: none"> • Check MEBS Log to verify the start of Data Ingest Operations. • Check MEBS Log to verify the availability of LEVEL 0 data in storage/staging. • Check MEBS Log to verify the availability of ancillary data in storage/staging. • Repeat these verification checks at ~2 hour intervals per data ingest schedules. 	N/A
5.1-3	S15-03	a. Monitor Data Ingest Operations: <ul style="list-style-type: none"> • Check MEBS Log to verify that LEVEL 0-to-L1A processing has started. • Check Product Catalog to verify that L1A products are generated. • Check Archive Request Queue (MEBS_ARQ) to verify archiving of Ancillary data and L1A products. • Check Scheduler to verify that ingest data processing is completing normally. 	N/A
5.1-3	S15-04	a. Monitor Product Generation Operations: <ul style="list-style-type: none"> • Check Job Catalog to verify that scheduled product generation operations are started for received L1A data. • Continually check Product Catalog to verify the availability L1B, L2, L3 and L4 products (and their metadata) for each set of L1A data received by the MEBS. • Check Job Catalog to verify that products/granules with "high-priority regions" identified in their schedules are processed first. • Check Product Catalog to verify that a Browse and a thumbnail image is produced each time an L2 Product is produced. • Log on to the MEBS WWW site once in while to verify the availability of Thumbnail images for selected products generated from the latest LEVEL 0 or L1A data ingests. • Continually check Archive Request Queue (MEBS_ARQ) to verify that generated products are being archived. • Continually monitor "staging disk" status to verify that disk space is being freed up as generated products are archived. • Respond to archive requests to move "filled" tapes off-line and to install "blank" tapes. • Check Job Catalog to verify that product generations schedules/recipes are completing normally. • Monitor MEBS log to verify that product generation operations are completed for each L1A data ingest. • Display Product Catalog to verify time and geographic ranges of the products. 	N/A

MEBS Req.	Test Case	Test Description	Additional Results
5.1-3	S15-05	a. Monitor MEBS Data Ordering and Distribution <ul style="list-style-type: none"> Log into MEBS WWW site, on a daily basis, to verify that MEBS can accept and register new users. Verify, on a daily basis, that MEBS users can create Standing Orders and Product Orders based on Catalog searches. Continually check the status of "MEBS Order Catalog" to verify normal delivery of products to users. Periodically attend to MEBDOS requests to mount/dismount "blank" tapes in accordance with product orders being processed. Periodically attend to Archive requests to mount/dismount tapes for product orders requiring data from the off-line archive. Attend to system device errors when encountered and alerted by MEBS. 	N/A
5.1-3	S15-06	a. Monitor/Generate MEBS Production Metrics <ul style="list-style-type: none"> Display/Print MEBS Job Catalog to review/collect resource (e.g., CPU and disk storage) utilization metrics for products generated for each LEVEL 0/L1A data set received by MEBS. Display/Print Job Catalog to review/collect MEBS daily processing performance (1000 jobs per day). Display/Print Product Catalog to review/collect MEBS daily production summary (total number of products generated, archived, retrieved and distributed). Display/Print MEBS Log to review/collect MEBS processing error summaries. 	N/A

6.2.6 Test Set 16 - Data Reprocessing (Data Versioning)

This test should repeat data processing tests from System Test Set 3 "Normal Product Generation", for reprocessing the same input data set. A successful test will generate new versions of the products generated earlier during the first run of System Test 3. This test set satisfies MEBS Requirement 5.7.

6.2.7 Test Set 17 - Workload Processing Performance

This test will be run in conjunction with the normal production processing test and system integration/scenario tests such as DILTs to determine (monitor and/or analyze) the maximum number of job that can be run on MEBS on a daily basis (Requirement: 1,000 jobs per day). Other statistics such as total number of products/granules in a day will also be collected and evaluated. This test may be rerun multiple times, as required, with upgraded MEBS hardware configurations, to meet MEBS required workload processing and throughput requirements. This test set satisfies MEBS Requirement 5.12.

6.2.8 Test Set 18 - MEBS Resources Allocation

This test will configure MEBS for concurrent use by MEBS operations, Test, MSTs, MCST, and SDST (Requirements MEBS 3.0-1 and MEBS 3.0-2). The test will verify that all users can concurrently use MEBS to access allocated capabilities and production results.

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APPENDIX A: ACRONYMS

ADR	Assumed Derived Requirement
CCB	Configuration Control Board
CCR	Configuration Change Request
CMO	Configuration Management Officer
COTS	Commercial-Off-the-Shelf
CSCI	Computer Software Configuration Item
DAAC	Distributed Active Archive Center
DAO	Data Assimilation Office
DDTs	Distributed Defect Tracking system
DILT	Day-In-the-Life Test
EDOS	EOS Data and Operations Systems
EOS	Earth Observing System
EOSDIS	Earth Observing System Data and Information System
ETET	End-To-End Test
FDF	Flight Dynamics Facility
GFE	Government Furnished Equipment
GSFC	Goddard Space Flight Center
HDF	Hierarchical Data Format
HILT	Hour-In-the-Life Test
I&T	Integration and Test
ICD	Interface Control Document
IDL	Interactive Data Language
JIT	Just-In-Time training
L1	Level 1
L2G	Level 2 Gridding
MCST	MODIS Characterization Support Team
MEBDOS	MEBS Data Ordering System
MEBS	MODIS Emergency Backup System
MODIS	Moderate Resolution Imaging Spectroradiometer
MST	MODIS Science Team

N/A	Not Applicable
NMC	National Meteorological Center
PDR	Preliminary Design review
PGE	Product Generation Executive
SDP	Software Development Plan
SDPS	Science Data Processing Software
SDST	Science Data Support Team
SI	System Integration
TBD	To Be Determined
TBR	To Be Resolved (before closure)
TRR	Test Readiness Review
URL	Universal Resource Locator
V1	Version 1 science software
V2	Version 2 science software
WILT	Week-In-the-Life Test

APPENDIX B: MODIS PRODUCT GENERATION EXECUTIVES AND PRODUCTS

B.1 Resource Requirements for PGEs

The MEBS Resource Requirements for PGEs Processing can be found in the MEBS Requirements document, SDST-097.

B.2 PGE Processing

The PGE processing data flow diagrams are provided in the MODIS Science Data Processing Software Version 1 System Description (SDST-065) and the MODIS Science Data Processing Software Version 2 System Description (SDST-104 to be written) documents.

B.3 MODIS Product Information

The MODIS Product information listing is available on-line on the WWW at URL:

<http://ftpwww.gsfc.nasa.gov/MODIS/SDST/mebs>

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APPENDIX C: MEBS PRODUCT GENERATION EXECUTIVES AND RECIPES

Table C-1. MEBS Version 1 PGEs and Recipes (TBR)

Recipe ID	Recipe Name	Stage	PGE	Level/Name	Process ID
MD0	Level 0	MOD00	1	L1A	MOD_PR01
		MOD01		Geolocation	MOD_PR03
MD1	Day L2	MOD01 (*3)	2	L1B	MOD_PR02
		MOD02	3	Masks/Profiles	MOD_PRANC
		MOD03			MOD_PR35
		AVN			MOD_PR07
		1D TOVS			MOD_PRVOLC
		RSST			
		MOD35_L2	4	L2 Atmosphere	MOD_PR05
		MODANCL2			MOD_PR04L
		MOD07_L2			MOD_PR04S
			6	L2 Clouds	MOD_PR06OD
					MOD_PR06CT
					MOD_PR06IR
			7	L2 Snow	MOD_PR10
			8	L2 Sea Ice	MOD_PR29
		NMC	9	L2 Ocean Color	MOD_PR18_L2
		2D TOVS			
			10	L2 SST	MOD_PR28_L2
		MOD05_L2	11	L2 Reflectance	MOD_PR09
		MODOCL2	17	L3 Ocean Color Space Bin	MOD_spbin
		MODOCL2A			
		MODOCL2B			
		MOD28L2	19	L3 Night SST Space Bin	MOD_spbin
					MOD_PR28D_I_O
MD2	Night L2	MOD01(*3)	2	L1B	MOD_PR02
		MOD02	3	Masks/Profiles	MOD_PRANC
		MOD03			MOD_PR35
					MOD_PR07
					MOD_PRVOLC
		NMC	10	L2 SST	MOD_PR28_L2
		2D TOVS			
		MOD05_L2	11	L2 Reflectance	MOD_PR09
		MOD28L2	19	L3 Night SST Space Bin	MOD_spbin

Recipe ID	Recipe Name	Stage	PGE	Level/Name	Process ID
MD3	Low prior L1	MOD01	2	L1B	MOD_PR02
		MOD02	3	Masks/Profiles	MOD_PRANC
		MOD03			MOD_PR35
					MOD_PR07
					MOD_PRVOLC
MD4	PGE16	MOD02	16	L2 LST	MOD_PR11A
		MOD03			
		MOD09			
		MOD35_L2			
		MOD10_L2			
		MOD07_L2			
MD5	L2G day per 1/16 tile per input geoloc granule	MOD03	12A	L2G Pointers	MOD_PRMGPNTR
		MODPT1KM	12B	L2G Geo Angles	MOD_PRMGGA
		MOD09	13A	L2G 250 m Reflectance	MOD_PR09G
		MODPT25M			
		MODPT5M	13B	L2G 500 m Reflectance	MOD_PR09G
		MOD14	13C	L2G Fire	MOD_PR14G
		MOD10_L2	14	L2G Snow	MOD_PR10G
MD7	Ocean interims	MOD029	15	L2G Sea Ice	MOD_PR29G
MD8	L3 Land	MOD0CBnn	20		
		MOD28Bmm			
		MODPT1KM	22	L3 BRDF/Subset	MOD_PR43B1
		MODPT25M			
		MODPT5M			
		MOD095SR			
		MOD092SR			
		MODGA			
		MOD15D3	33	L3 LAI/FPAR Daily	MOD_PR15A1
					MOD_PR15A2
		MOD10L2G	43	L3 Snow Daily	MOD_PR10A
		MOD29DG	44	L3 Sea Ice Daily	MOD_PR29A
MD9	Level 3 interim land aerosol	MOD4L_L2	5	L3 Interim Land Aerosol	MOD_PR04LA

Table C-2. MEBS Version 2 PGEs and Recipes (TBR)

Recipe ID	Recipe Name	Stage	PGE Level and Name	Process ID
			PGE01 Level 1A/ Geolocation	MOD_PR01
				MOD_PR03
			PGE02 Level 1B Calibration	MOD_PR02
			PGE03 Stability/ Profiles	MOD_PR35
				MOD_PR07
				MOD_PRVOLC
			PGE04 L2 Atmosphere	MOD_PR04_05
			PGE05 L3 Interim Land Aerosol	MOD_PR04ORB
			PGE06 L2 Clouds	MOD_PR06
			PGE07 L2 Snow	MOD_PR10
				MOD_PRLQA
			PGE08 L2 Sea Ice	MOD_PR29
				MOD_PRLQA
			PGE09 L2 Ocean Color	MOD_PR18
				MOD_PRmsbin
			PGE10 L2 SST	MOD_PR28
				MOD_PRmsbin
			PGE11 L2 Reflectance	MOD_PR09
				MOD_PRLQA
			PGE12 L2G Pointers	MOD_PRMGPNTR
				MOD_PRMGR
				MOD_PRLQA
			PGE13 L2G Reflectance/Fire	MOD_PRMGR
			PGE14 L2G Snow	MOD_PRMGR
				MOD_PRLQA
			PGE15 L2G Sea Ice	MOD_PRMGR
				MOD_PRLQA
			PGE16 L2/L3 LST	MOD_PR11
				MOD_PRLQA
			PGE17 Oceans Ancillary Meteorological Preprocess	MOD_PRNMC
			PGE19 Oceans Ancillary Ozone Preprocess	MOD_PROZN
			PGE20 L3 Oceans Interim Daily	MOD_PRmtbin
			PGE21 L3 Land Surface Reflectance	MOD_PR09A
				MOD_PRLQA
			PGE22 L3 Aggregation	MOD_PRAGG
				MOD_PRLQA
			PGE23 L3 BRDF/ BARS	MOD_PR43B2
				MOD_PRLQA

Recipe ID	Recipe Name	Stage	PGE Level and Name	Process ID
			PGE24 CMG BRDF 16-day	MOD_PR43C
				MOD_PRLQA
			PGE25 L3 VI 16-day	MOD_PR13A1
				MOD_PR13A2
				MOD_PRLQA
			PGE26 L3 VI Monthly	MOD_PR13A3
				MOD_PRLQA
			PGE27 CMG VI 16-day	MOD_PR13C2
				MOD_PRLQA
			PGE28 CMG VI Monthly	MOD_PR13C3
				MOD_PRLQA
			PGE29 L3 Fire 8-day	MOD_PR14A
				MOD_PRLQA
			PGE30 L3 Fire Monthly	MOD_PR14A
				MOD_PRLQA
			PGE31 L3 LST 8-day	MOD_PR11A
				MOD_PRLQA
			PGE32 CMG LST Daily	MOD_PR11C
				MOD_PRLQA
			PGE33 L4 LAI/FPAR Daily	MOD_PR15A2
				MOD_PRLQA
			PGE34 L4 LAI/FPAR 8-day	MOD_PR15
				MOD_PRLQA
			PGE35 CMG LAI/FPAR 8-day	MOD_PR15C
				MOD_PRLQA
			PGE36 L4 NPP Daily	MOD_PR17A1
				MOD_PRLQA
			PGE37 L4 NPP 8-day	MOD_PR17A2
				MOD_PRLQA
			PGE38 L4 NPP Yearly	MOD_PR17
				MOD_PRLQA
			PGE39 CMG NPP 8-day	MOD_PR17C
				MOD_PRLQA
			PGE40 L3 Land Cover Monthly	MOD_PR12M
				MOD_PRLQA
			PGE41 L3 Land Cover Quarterly	MOD_PR12Q
				MOD_PRLQA
			PGE42 CMG Land Cover Quarterly	MOD_PR12C
				MOD_PRLQA
			PGE43 L3 Snow Daily	MOD_PR10A1
				MOD_PRLQA
			PGE44 L3 Sea Ice Daily	MOD_PR29A1
				MOD_PRLQA

Recipe ID	Recipe Name	Stage	PGE Level and Name	Process ID
			PGE45 L3 Snow 8-day	MOD_PR10A2
				MOD_PRLQA
			PGE46 CMG Snow Daily	MOD_PR10C1
				MOD_PRLQA
			PGE47 L3 Sea Ice 8-day	MOD_PR29A2
				MOD_PRLQA
			PGE48 CMG Sea Ice Daily	MOD_PR29C1
				MOD_PRLQA
			PGE49 L3 Oceans Interim Weekly	MOD_PRmtbin
			PGE50 L3 Oceans Reference 3 week	MOD_PRmtbin
				MOD_PRmfill
			PGE51 Ocean Productivity Running Year	MOD_PR27W
				MOD_PR27Y
			PGE52 L3 Oceans Weekly Running Year	MOD_PRmtbin
				MOD_PR27HV
			PGE53 L3 Oceans Daily	MOD_PRmcloud
			PGE54 L3 Ocean Weekly	MOD_PRmtbin
			PGE55 L3 Daily Clear Sky	MOD_PRCR
			PGE56 L3 Atmosphere Daily	MOD_PR08D
				MOD_PR08DC
			PGE57 L3 Atmosphere Monthly	MOD_PR08M
				MOD_PR08MC
			PGE58 CMG LST 8-day	MOD_PR11C2
				MOD_PRLQA
			PGE59 CMG LST Monthly	MOD_PR11C3
				MOD_PRLQA
			PGE60 CMG Fire Daily	MOD_PR14C
				MOD_PRLQA
			PGE61 CMG Fire 8-day	MOD_PR14C
				MOD_PRLQA
			PGE62 CMG Fire Monthly	MOD_PR14C
				MOD_PRLQA
			PGE63 CMG LAI//FPAR Monthly	MOD_PR15C
				MOD_PRLQA
			PGE64 CMG NPP Yearly	MOD_PR17C
				MOD_PRLQA
			PGE65 CMG BRDF Monthly	MOD_PR43C
				MOD_PRLQA
			PGE66 L4 250m Land Cover	MOD_PR44A
				MOD_PRLQA

Recipe ID	Recipe Name	Stage	PGE Level and Name	Process ID
			PGE67 CMG Snow 8-day	MOD_PR10C
				MOD_PRLQA
			PGE68 CMG Sea Ice 8-day	MOD_PR29C
				MOD_PRLQA
			PGE69 Atmosphere Daily Zonal Tiling	MOD_PR08T
				MOD_PR08TC